

Name: _____

GCSE (1 – 9)

Direct and Inverse Proportion

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

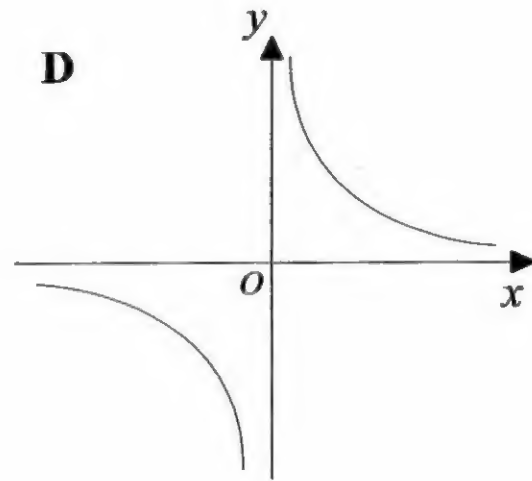
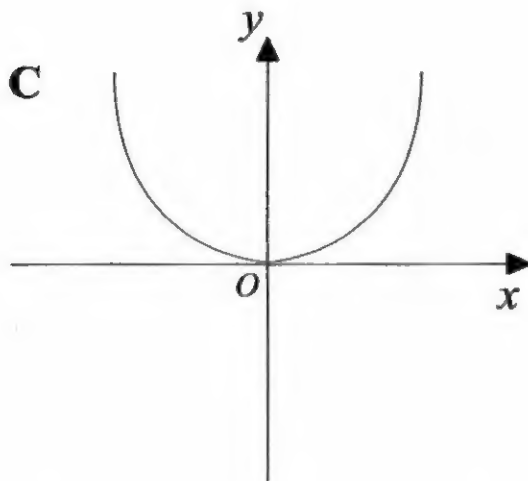
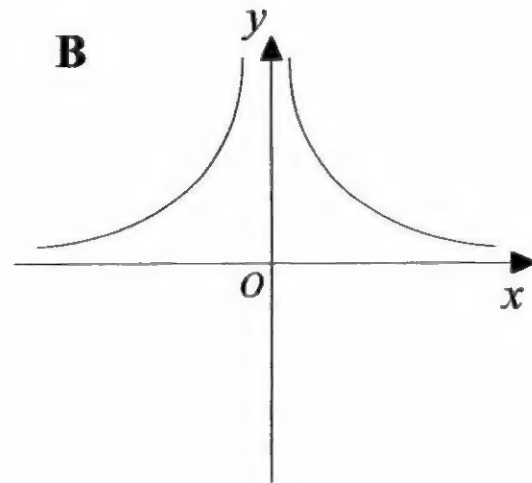
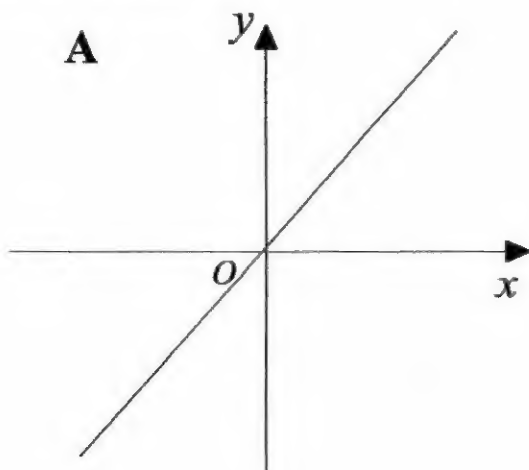
Information

- The marks for each question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1 Here are four graphs.



Match each graph with a statement in the table below.

Proportionality relationship

y is directly proportional to x

y is inversely proportional to x

y is directly proportional to x^2

y is inversely proportional to x^2

Graph letter

A

D

C

B

(Total for question 1 is 2 marks)

2 a is directly proportional to b

When $a = 7$, $b = 28$

Find the value of b when $a = 5$

$$\begin{aligned}a &= kb \\ 7 &= k(28) \\ k &= \frac{7}{28} \\ &= \frac{1}{4}\end{aligned}$$

$$\therefore a = \frac{1}{4}b$$

when $a = 5$

$$5 = \frac{1}{4}b$$

$$\underline{\underline{b = 20}}$$

$$b = \underline{\underline{20}}$$

(Total for question 2 is 3 marks)

3 c is inversely proportional to d

When $c = 3$, $d = 8$

Find the value of c when $d = 2$

$$c = \frac{k}{d}$$

$$3 = \frac{k}{8}$$

$$k = 24$$

$$\therefore c = \frac{24}{d}$$

when $d = 2$

$$c = \frac{24}{2}$$

$$= 12$$

$$c = \underline{\underline{12}}$$

(Total for question 3 is 3 marks)

4 e is directly proportional to f

When $e = 3, f = 36$

Find the value of f when $e = 4$

$$e = kf$$

$$3 = k(36)$$

$$k = \frac{3}{36}$$

$$= \frac{1}{12}$$

$$\therefore e = \frac{1}{12}f$$

when $e = 4$

$$4 = \frac{1}{12}f$$

$$\underline{\underline{f = 48}}$$

$$f = \dots 48 \dots$$

(Total for question 4 is 3 marks)

5 g is directly proportional to the square root of h

When $g = 18, h = 16$

Find the possible values of h when $g = 2$

$$g = k\sqrt{h}$$

$$18 = k\sqrt{16}$$

$$18 = k(4)$$

$$k = \frac{18}{4} = \frac{9}{2}$$

$$\therefore g = \frac{9}{2}\sqrt{h}$$

when $g = 2$

$$2 = \frac{9}{2}\sqrt{h}$$

$$4 = 9\sqrt{h}$$

$$\frac{4}{9} = \sqrt{h}$$

$$\underline{\underline{h = \frac{16}{81}}}$$

$$h = \dots \frac{16}{81} \dots$$

(Total for question 5 is 3 marks)

6 y is inversely proportional to x

When $y = 15$, $x = 4$

Find the value of y when $x = 12$

$$y = \frac{k}{x}$$

$$15 = \frac{k}{4}$$

$$60 = k$$

$$\therefore y = \frac{60}{x}$$

$$\text{when } x = 12 \quad y = \frac{60}{12} = 5$$

$$y = \dots\dots\dots 5$$

(Total for question 6 is 3 marks)

7 x is inversely proportional to the square root of y

When $x = 12$, $y = 9$

Find the value of x when $y = 81$

$$x = \frac{k}{\sqrt{y}}$$

$$12 = \frac{k}{\sqrt{9}}$$

$$12 = \frac{k}{3}$$

$$k = 36$$

$$\therefore x = \frac{36}{\sqrt{y}}$$

$$\text{when } y = 81 \quad x = \frac{36}{\sqrt{81}} = \frac{36}{9} = 4$$

$$x = \dots\dots\dots 4$$

(Total for question 7 is 3 marks)

8 y is inversely proportional to the cube of x

When $y = 250, x = 0.2$

Find the value of y when $x = 0.5$

$$y = \frac{k}{x^3}$$
$$250 = \frac{k}{(0.2)^3}$$

$$250 = \frac{k}{(1/125)}$$

$$k = 2$$

$$\therefore y = \frac{2}{x^3}$$

when $x = 0.5$

$$y = \frac{2}{(0.5)^3}$$

$$y = \frac{2}{1/8} = 16$$

$$0.2 = \frac{1}{5}$$
$$(0.2)^3 = \frac{1}{125}$$

$$0.5 = \frac{1}{2}$$

$$0.5^3 = \frac{1}{8}$$

$$y = \dots 16 \dots$$

(Total for question 8 is 3 marks)

9 x is directly proportional to the cube of y

When $x = 32, y = 0.4$

Find the value of y when $x = 256$

$$x = ky^3$$
$$32 = k(0.4)^3$$

$$32 = \frac{8k}{125}$$

$$k = 500$$

$$\therefore x = 500y^3$$

when $x = 256$

$$256 = 500y^3$$

$$\frac{256}{500} = y^3$$

$$0.4 = \frac{2}{5}$$

$$0.4^3 = \frac{8}{125}$$

$$y^3 = \frac{64}{125}$$

$$y = \frac{4}{5}$$

$$y = \dots \frac{4}{5} \dots$$

(Total for question 9 is 3 marks)

10 The table shows pairs of values for x and y

x	2	3
y	32	72

(i) Tick the correct statement below.

$$y = kx$$

$$32 = 2k$$

$$k = 16$$

and

$$72 = 3k$$

$$k = 24$$

X

$$y = kx^2$$

$$32 = k(4)$$

$$k = 8$$

and

$$72 = k(9)$$

$$k = 8$$

✓

$$y = kx^3$$

$y \propto x$
$y \propto x^2$ ✓
$y \propto x^3$

(ii) Write a formula for y in terms of x

$$\underline{\underline{y = 8x^2}}$$

$$y = 8x^2$$

.....

(Total for question 10 is 4 marks)

11 The table shows pairs of values for x and y

x	4	5
y	256	500

(i) Tick the correct statement below.

$$y = kx$$

$$256 = k(4)$$

$$k = 64$$

$$500 = k(5)$$

$$k = 100$$

X

$$y = kx^2$$

$$256 = k(16)$$

$$k = 16$$

$$500 = k(25)$$

$$k = 20$$

X

$$y = kx^3$$

$$256 = k(64)$$

$$k = 4$$

$$500 = k(125)$$

$$k = 4$$

✓

$$y \propto x \quad \dots\dots\dots$$

$$y \propto x^2 \quad \dots\dots\dots$$

$$y \propto x^3 \quad \dots\dots\dots \checkmark$$

(ii) Write a formula for y in terms of x

$$y = 4x^3$$

$$y = 4x^3$$

(Total for question 11 is 4 marks)